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PTR-MS measurements in indoor environments

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Indoor air research is receiving growing attention, reflecting the fact that in developed parts of the world people spend about 90% of their lives indoors. Among the indoor environments receiving attention have been those in office buildings and aircraft cabins. Primary emissions from building materials and furnishing, and secondary emissions generated from the reactions of ozone with gas-phase compounds or indoor surfaces, can degrade perceived air quality in office buildings and may contribute to Sick Building Syndrome (SBS) symptoms and ill health. Cabin air quality may induce perceived discomfort, respiratory ailments and other health problems in cabin occupants. In an attempt to investigate the role of volatile organic compounds (VOCs) in this context, proton-transfer-reaction mass spectrometry (PTR-MS) was used as an analytical technique to monitor VOC levels in different indoor environments with different pollution sources present and with different air purification technologies in use. Sensory analysis was carried out for some of the studies to provide a measure of the human response to certain indoor environments. The investigated scenarios included an office with different pollution sources (carpet, linoleum, chipboard) equipped with an air purification unit, an office with typical indoor ozone levels and a limonene source (frequent component of air fresheners) and a simulated aircraft cabin with ozone levels similar to those that have been observed during commercial air travel. The results indicate that the air purification unit can be efficiently used to reduce VOC loads in indoor environments and to improve air quality as perceived by humans. Ozone was found to be an important precursor for indoor VOCs. Ozone-initiated gas-phase chemistry (e.g. ozone-limonene reactions) formed a large spectrum of products including short lived, highly reactive compounds as well as secondary organic aerosols. In addition, a series of odour-active aldehydes was observed to be formed from ozone-fabric interactions in

the simulated aircraft cabin. Secondarily generated species (both oxidized VOCs, and secondary organic aerosols) may be of greater concern to human health than exposure to ozone itself. Selected topics of the conducted research will be presented.